91602
new 82-10

COMPLIMENTARY COPY
Please Credit Ontario Hydro Research If
Reproduced in Whole or in Part

ontario hydro
research division

To: Dr. D. Mills
Director of Research

**INTERNATIONAL UTILITY SYMPOSIUM:
HEALTH EFFECTS OF ELECTRIC AND MAGNETIC FIELDS
TORONTO, SEPTEMBER 16-19, 1986**

K. E. Donnelly and S. M. Harvey

An International Utility Symposium on the health effects of electric and magnetic fields, co-sponsored by Ontario Hydro and held in Toronto on September 16-19, 1986, was attended by the authors. Symposium proceedings are available separately; this report comments on some aspects of the symposium of particular interest to the Research Division.

INTRODUCTION

Faced with increasing public concern that there may be adverse health effects associated with chronic exposure to the electric and magnetic fields produced by power lines, electrical utilities need to be well informed about the scientific, legal, and public relations aspects of this issue. The International Utility Symposium on the Health Effects of Electric and Magnetic Fields, held in Toronto on September 16-19, provided an opportunity to hear the issue discussed at first hand. The symposium was sponsored by Ontario Hydro jointly with the Electric Power Research Institute, the Canadian Electrical Association, the Edison Electric Institute, the National Rural Electric Cooperative Association, and the Bonneville Power Administration.

job	file	date	report no.
16-625-000	817.22	November 14, 1986	86-302-K

HISTORICAL PERSPECTIVE

Up until the late 1970's, biological effects researchers were generally of the opinion that any health related effects produced by exposure to electromagnetic fields were thermal in origin, ie that the effects were produced by the heating of body tissue to elevated temperatures. Exposure limits were, therefore, conservatively designed to avoid significant heating. However, A few investigators were convinced that measurable biological responses could be produced under selected conditions where exposures were too low to cause any temperature rise. Through meticulous and pioneering laboratory research, these investigators have now demonstrated that some biological effects can be observed at the cellular level, even where field levels are far too low to cause obvious tissue heating.

Acceptance of these findings seems to have triggered a swing of the pendulum, some biological effects researchers now holding the viewpoint that any exposure to electromagnetic fields, no matter how weak, has the potential to produce adverse health effects in people or animals. One consequence has been a call by these biologists for action on the part of public health regulators to reduce people's exposure to electric and magnetic fields.

Public health regulators and periodically-formed review panels who have the responsibility of seeing that people are not exposed to undue hazards, are understandably reluctant to be pushed into precipitous and possibly irresponsible action on the basis of this hypothesis. Their reviews confirm that there is no evidence of any effect on public health of the type usually required to establish exposure limits and, in addition, no guideline of any kind on how to proceed in a way that could be demonstrated to have a beneficial effect. At the same time, these agencies are not in a position to declare that such concerns are groundless.

Unfortunately, debate on this issue and arguments over the need for new exposure limits and where, if anywhere, these limits need to be set, when they take place in the public media, tend less to inform the public than to arouse concerns and fears. This has certainly been the case with high-voltage power lines and other sources of 60-Hz electric and magnetic fields with the result that electrical utilities have been caught in the middle. Such origins notwithstanding, the electrical power industry is increasingly being called upon to assume the burden of proving that the electricity it produces is indeed safe.

In this International Utility Symposium, the various protagonists were invited to present their views before an audience of electrical utility personnel and other interested parties. The objectives set by the organizing committee were as follows:

- To review the state of scientific knowledge of the health and biological effects of electric and magnetic fields with particular reference to studies of interest to electric utilities;
- to illustrate public communications programs used by organizations faced with these challenges; and
- to identify existing and proposed regulations for electric and magnetic field exposures and illustrate utility experiences in administrative and judicial proceedings.

GENERAL COMMENTS

This conference provided up-to-date coverage of research results, communication programs, and regulatory and legal affairs regarding the health effects of power line electric and magnetic fields. There were over 300 registrants, representing utilities and power consortia from across North America, Europe and Australia; in addition there were researchers, consultants, journalists and other parties with interests in bioelectromagnetic effects.

Some of the major players in the research and consulting areas (such as Drs. Graves, Sheppard, Marino and Phillips) made presentations and took part in panel discussions and question periods, providing an opportunity for attendees to evaluate their viewpoints firsthand as well as to observe the positioning that takes place in such controversies.

A conference program is appended as Appendix; nearly all speakers provided extensive written material which is available from the writers.

SPECIFIC COMMENTS

Magnetic Field Dosimeters

The Science and Electronics Sections, in conjunction with Health and Safety Division, have developed a pocket-sized magnetic field exposure monitor which records data for a week. Several groups, it appears, are in the process of developing similar instruments, so there was considerable interest in Ontario Hydro's device. We believe it gained respect for Hydro's program in bioelectromagnetic effects for the following reasons:

1. **Appearance:**. The unit is black anodized and professionally labelled, and has a look of being crafted by true instrument makers.

2. **Size:** The unit is pocket sized and self-contained, important features in a personal device; many other devices are portable but fairly intrusive when worn by a lineman or other study subject.

3. **Number**: Ontario Hydro has six units ready to be deployed in a study this fall. Hydro Quebec's unit, while technically very sophisticated and of nearly identical size to ours, is still not in production, though they were demonstrating a working unit. The EPRI unit is larger, due to much more complex data processing needs, and still seems to be at a one-off stage.

Although the Ontario Hydro dosimeter is a low-budget device and not intended to be competitive with the other instruments (whose features include 3-axis magnetic field measurement vs. single-axis; electric field included vs a separate dosimeter), we are likely to be among the first off the mark in getting realistic exposure data for linemen and maintenance workers

Small Animal Studies

There was considerable interest in the experimental protocol for small animal studies being proposed by Ontario Hydro, both for power-frequency and for VDU type magnetic fields. Discussions were held with W. E. Feero of Electric Research and Management Inc., L. A. Rosen of W/L Associates Limited, performance consultants, J M. Charry of Environmental Research Information, Inc and R. F. Bettendorf of IBM Corporation, and an exchange of information has been initiated.

Risk Assessment

Although there is definite evidence of biological effects at the level of isolated cells, there is considerable uncertainty whether these translate into an increased potential for harm. Epidemiological evidence is ambiguous and there is a recognized need for better exposure data.

The risk assessment community of 1986 was not well represented at this conference, compared, say, to the May 1985 conference on Environmental Risks at the University of Waterloo which one of these authors (K.E. Donnelly) also attended. The evidence and approaches to risk at this Utilities Symposium were largely dictated by the biological researchers, without additional input and viewpoints from economists and other decision makers (on the other hand, some purely economic approaches were soundly criticized at the Waterloo conference).

This domination by the scientific researchers may be natural in an area where adverse health effects have not been demonstrated and public perceptions have not crystallized, unlike the situation with chemical and nuclear wastes. However, in those areas, the prevailing approaches to risk assessment and management are now represented by Granger Morgan of Carnegie-Mellon University (present at this symposium), Paul Slovic of Decision Research, J. Kasperson of Clark University, and others. Their approach focuses on questions of perception and acceptability of risk, and of determining other dimensions bearing on the acceptability of technology and public decision making processes. These are questions which may have more bearing on power line issues than the ability to determine a risk level numerically.

The older (and more purely scientific) approach, now regarded as unsuccessful, may be characterized as "The public needs to be educated - they'll agree with us when they know the facts"; the -newer approaches might be "Public views are often highly rational - we need to know what values and even biases are determining these views". A recent research study/1/ concludes "... people's acceptance of risks may be determined, to a significant extent, by the way in which decisions abou risks are made. If so, an acceptable risk may be one arising from an acceptable decision-making process."

These are important issues in areas with a large component of public involvement such as power line siting.

CONCLUSIONS

The International Utility Symposium was well organized and, judging by attendance, quite successful. Many of the principal players in the health effects field were there. Attendance at the symposium resulted in useful exchanges of information and the establishment of important contacts among other researchers.

Approved:	Submitted:	Submitted:
A.F. Baljet Manager Electrical Research Dept	K.E. Donnelly Engineering Physicist Science Section	S.M. Harvey Engineer/Physicist Science Section

REFERENCE

1. MacGregor, D. and P. Slovic. "Perceived Acceptability of Risk Analysis as a Decision-Making Approach." Risk Analysis, Vol. 6, No 2, 245 (1986).

APPENDIX

International Utility Symposium

Health effects of electric and magnetic fields: Research, Communication, Regulation

Constellation Hotel, Toronto, Ontario
September 16-19, 1986

PROGRAM

September 16, 1986
PRE-SESSION ACTIVITIES

ONTARIO HYDRO WORKSHOP – 8:30 am – 3:30 pm
Ontario Hydro will sponsor a free optional workshop at its Transmission Effects Demonstration Centre for utility personnel interested in learning more about its community relations programs. Transportation from the Constellation Hotel and lunch will be provided.

SYMPOSIUM REGISTRATION – 6:00 pm – 9:00 pm
HOST RECEPTION – A CELEBRATION OF ONTARIO WINES
7:00 pm – 9:00 pm

September 17, 1986 **Session 1 – 8:30 am to 2:45 pm**
STATE OF THE SCIENCE – ELECTRIC AND MAGNETIC FIELDS

Introduction by Symposium Chairman	*Mr. John O'Grady, Ontario Hydro*
Issue Background	*Mr. William Feero, Electric Research & Management*
Properties and Effects of A.C. and D.C. Line Fields	*Dr. Dan Bracken, T. Dan Bracken Inc.*
Studies of Cells and Tissues Exposed to (ELF) Fields	*Dr. Asher Sheppard, Pettis Veterans Administration Hospital – Loma Linda*
Studies of Laboratory Animals Exposed to ELF Fields	*Dr. Larry Anderson, Battelle Pacific Northwest Laboratory*
Cardiac Pacemakers: Effects of Power Frequency Fields	*Dr. Jerry Griffin, University of California*
Human Health Studies on Exposure to Fields	*Dr. David Savitz, University of North Carolina*

LUNCH

Studies of A.C. Transmission Line Fields in the Natural Environment	*Mr. Jack Lee, Bonneville Power Administration*
Thinking About HVDC As An Alternative Technology? The Problems Don't Go Away	*Mr. Robert Banks, Robert S. Banks & Associates*

September 17, 1986 **Session 2 – 3:00 pm to 9:30 pm**
HEALTH RISK EVALUATIONS

World Health Organization	*Dr. Richard Phillips, US Environmental Protection Agency*
American Institute of Biological Sciences	*Dr. H.B. Graves, Biological Effects Consulting*
Florida Electric and Magnetic Fields Science Advisory Commission	*Dr. H.B. Graves, Biological Effects Consulting*
Health Risks from Electric Power Facilities	*Dr. Andrew Marino, Louisiana State University*

International Utility Symposium

Health effects of electric and magnetic fields: Research, Communication, Regulation

Constellation Hotel, Toronto, Ontario
September 16-19, 1986

DINNER BREAK

Panel Discussion – "What is the likelihood that electric power facilities pose a hazard to human health from long term exposure?"	*Dr. H.B. Graves* *Dr. Andrew Marino* *Dr. Richard Phillips* *Dr. Asher Sheppard* *Moderator:* *Dr. Sol Sax* *Ontario Hydro*

September 18, 1986 Session 3 – 8:30 am to 12:00 pm
TRENDS IN REGULATION

The Need for Electric and Magnetic Field Limits in Canada	*Dr. Maria Stuchly* *Health & Welfare Canada*
Regulation of Exposure to Extra Low Frequency Fields – An American Perspective	*Mr. David Janes* *U.S. Environmental Protection Agency*
Existing Regulation of Fields in the United States	*Mr. Robert Banks* *Robert S. Banks & Associates*
Standard Setting in the USA:	
A View from New York	*Mr. Dan Driscoll* *New York State Department of Public Service*
A View from Montana	*Mr. Van Jamison* *Montana Department of Natural Resources and Conservation*
Guidelines and Standards for Fields Around the World (excluding North America)	*Mr. Brian Maddock* *Central Electricity Research Laboratory (Britain)*
Forthcoming Guidelines from International Scientific Organizations	*Mr. David Sliney* *US Army, Environmental Hygiene Agency*

LUNCH

September 18, 1986 Session 4 – 1:00 pm to 5:00 pm
EVALUATION OF COMMUNICATION PROGRAMS

Goals and Effectiveness of Ontario Hydro's Transmission Effects Communication Program	*Mr. John O'Grady* *Ontario Hydro*
Paths of Power	*Mr. Jay Franklin* *Midcontinental Area Power Pool*
Vattenfall's Transmission Line Communication Program	*Mr. Rolf Lindgren* *Vattenfall (Sweden)*
New York's Communication Programs	*Mr. Michael Fuimarelli* *New York Power Authority*
Panel Discussion – The four speakers will respond to questions as a panel	*Moderator:* *Dr. Janet Baas* *Southern California Edison Co.*

International Utility Symposium

Health effects of electric and magnetic fields: Research, Communication, Regulation

Constellation Hotel, Toronto, Ontario
September 16-19, 1986

BANQUET

Keynote address on corporate responsibility regarding the risks of new technology	*Dr. David Bates* *Faculty of Medicine* *University of British Columbia*

September 19, 1986 Session 5 - 8:30 am to 12:00 pm
RELATIONS WITH THE PUBLIC AND THE MEDIA

Public Relations:

Public Involvement in Utility Decisions	*Mr. James Creighton* *Creighton & Creighton Inc.*
Public Perceptions of Risk from Electric and Magnetic Fields	*Dr. Granger Morgan* *Carnegie-Mellon University*
Employee Communications	*Ms. June Small* *Florida Power and Light*

Media Relations:

Colstrip Transmission Project	*Mr. George Eskridge* *Bonneville Power Administration*
Hydro Quebec's First DC Line: Nicolet Des Cantons/New England	*Mr. Robert Benoit* *Hydro Quebec*
Brunswick to Richmond Upgrade	*Mr. Peter Wallace* *State Electricity Commission of Victoria (Australia)*
Panel Discussion - The three media speakers will respond to questions as a panel.	*Moderator:* *Ms Barton Sala* *Ontario Hydro*
Powerlines, Journalism and the Heart-break of Psoriasis	*Mr. Kennedy Maize* *Energy Daily*

LUNCH

September 19, 1986 Session 6 - 1:00 pm to 3:30 pm
CONTROVERSIES - LESSONS LEARNED FROM ADMINISTRATIVE & JUDICIAL PROCEEDINGS

Experience and Lessons from Texas	*Ms Nancy Leshikar* *Kleberg, Dyer, Redford & Weil* *Representing Central Power and Light*
Narrowing the Scope of Hearings: A Nonadversarial Legal Strategy	*Mr George Wortman* *Ontario Hydro*
Health Effects from HVDC Transmission Lines: Resolution of the Minnesota Controversy	*Mr. Dan McConnon* *United Power Association*
Lessons from California	*Mr. Norman Kuch* *Southern California Edison Co.*
The Florida Experience	*Mr. Carlos Alvarez* *Hopping, Boyd, Green & Sams* *Representing Florida Electric Power Coordinating Group*
Panel Discussion: The five speakers will respond to questions as a panel	*Moderator:* *Mr. Henry Nowak* *Niagara Mohawk Power Corp.*

DISTRIBUTION

Dr. D. Mills		Director of Research
Mr. D.A. Lee		Health & Safety, H2A20
Mr. A.F. Baljet		Research
Dr. N. Anyas-Weiss		Research
Mr. R.D. Brown		Research
Dr. K.E. Donnelly	(2)	Research

BEEF Committee

Members

Mr. C.E. Taylor		Design & Dev - Trans, H8A6
Mr. J.P. O'Grady		Design & Dev - Trans, H8E4
Mr. W.A. Maw		Design & Dev - Trans, U8D1
Mr. D.J. Horrocks		Design & Dev - Trans, H9G27
Mr. V. Inkis		Transmission Operations, U7E1
Mr. V.D. Horsley		Transmission Operations, U8B3
Mr. D.W. Robinson		Public Hearing, H19E13
Dr. S.E. Sax		Health & Safety, H2E27
Mr. M.L. Walsh		Health & Safety, Pickering
Dr. D. Agnew		Health & Safety, Pickering
Dr. G.L. Vascotto		Research
Dr. S.M. Harvey	(2)	Research

Public Reference Centre	
Editorial Section	(2)
Office Copies	(2)
Extra Copies	(3)